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ARTIFICIAL KEY TO THE WEED SEEDS FOUND IN
COMMERCIAL SEEDS IN ILLINOIS AND
ADJOINING STATES

BY

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A. B. University of Michigan, 1912.

THESIS

Submitted in Partial Fulfillment of the Requirements for the

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IN

THE GRADUATE SCHOOL

OF THE

UNIVERSITY OF ILLINOIS

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UNIVERSITY OF ILLINOIS
THE GRADUATE SCHOOL

May 21st, 1918

I HEREBY RECOMMEND THAT THE THESIS PREPARED UNDER MY
SUPERVISION BY Richard Alonzo Gantz,
ENTITLED Artificial Key to the Weed Seeds Found in
Commercial Seeds in Illinois and Adjoining States.

BE ACCEPTED AS FULFILLING THIS PART OF THE REQUIREMENTS FOR
THE DEGREE OF Master of Science

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In Charge of Thesis

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Recommendation concurred in*

Committee

on

Final Examination*

*Required for doctor's degree but not for master's

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Introduction

The purpose of this work is to aid one to determine the weed seeds and seed-like-fruits frequently found in commercial grains of Illinois and adjoining states. The term, seed, in this key, is used to mean a ripened ovule. It is not used to include fruits such as an achene and caryopsis. If the structure is a fruit, it is named as such.

Since the terms seed, fruit, achene, caryopsis, nut, nutlet, utricle, spike, spikelet and involucre are used, it is necessary to define them. A seed is a ripened ovule; e.g., wild mustard. A fruit is a ripened ovary with its attachments; e.g., common ragweed. An achene is a seed-like indehiscent fruit in which the seed is not firmly united with the wall of the ovary; e.g., curled dock. A caryopsis is a similar one seeded indehiscent fruit in which the seed is firmly united with the wall of the ovary; e.g., cheat. A nut is a dry indehiscent fruit usually one celled and one seeded, with a hard bony wall; e.g., hazel-nut. A nutlet is a diminutive nut; e.g., wheat thief. A utricle is a small one seeded dry fruit with a thin bladdery loose ovary wall. When ripe the wall bursts and the seed is exposed; e.g., lamb's quarters. A spike is a form of inflorescence with the sessile flowers arranged on an elongated common axis; e.g., wheat. A spikelet is a small or secondary spike. It may consist of a one seeded fruit, caryopsis, enclosed by coverings, which are scale-like, called lemma, palea, and outer glumes; e.g., yellow fox-tail. An involucre is a cluster of small leaves or bracts just below the flower. It may be modified and enclose an achene; e.g.,

common ragweed.

The seeds and seed-like-fruits were gathered during the years of 1916 and 1917 in Champaign County, Illinois. By examining commercial seeds obtained from seed houses, by getting expressions from various seed-dealers, by consulting bulletins and other literature which list troublesome weed-seeds in grains, and by the writer's experience with weed-seeds on the farm, the thirty-one seeds and fruits, which make up the key, were selected.

The descriptions have been made with the use of a lens which magnifies about ten diameters. A simple lens known as "linen tester" gives very good results. Photographs show seeds and fruits magnified four diameters. Descriptions were made and photographs taken of the fruits after they were rubbed between thumb and forefinger. The nomenclature and order of classification are those of Gray's New Manual of Botany, seventh edition, 1908. When other names are used in common manuals they are placed in parenthesis.

Two previous weed-seed keys have been made. One by Edgar Brown and F. H. Hillman, keying the seeds of six species of Poa as found in commercial seeds. "The Seeds of the Blue Grass", Bulletin 84 of Bureau of Plant Industry, U.S.D.A. The other by E. L. Palmer in which he makes a seed key to some common weeds and plants. "A Seed Key to some Common Weeds and Plants", Iowa State Academy of Science, 1916. The work was done under the direction of Professor William Trelease of the Botany Department of the University of Illinois. The writer desires to acknowledge the many helpful suggestions received.

1. Terminal appendages present. 2.
Terminal appendages absent. 4.
2. Appendages stiff, spiny; fruit top-shaped. *Ambrosia artemisiifolia*.
Appendages scale-or bristle-like. 3.
3. Achene with 2 rows of scales at apex. *Cichorium Intybus*.
Achene with a whorl of short bristles at apex. *Erigeron annuus*.
4. Seeds shot-like. 5.
Seeds or achenes not shot-like. 6.
5. Seeds black, surface scarcely reticulated. *Brassica arvensis*.
Seeds brownish, surface distinctly reticulated. *Brassica nigra*.
6. Triangular in cross section. 7.
Not triangular in cross section. 10.
7. Achene black, granular, angles rounded. *Polygonum Convolvulus*.
Achene brown. 8.
8. Achene attenuate at apex. 9.
Achene not attenuate at apex, 1 to 1.5 mm. long. *Rumex Acetosella*.
9. Achene shiny, 1.5 to 2.5 mm. long. *Rumex crispus*.
Achene not shiny, 2 mm. long, acuminate. *Rumex obtusifolius*.
10. Canoe shaped. 11.
Not canoe shaped. 12.
11. Convex side with groove across the middle. *Plantago aristata*.
Convex side not grooved. *Plantago lanceolata*.
12. Surface sculptured. 13.
Surface not sculptured. 17.
13. Surface granular. 14.
Surface otherwise. 16.
14. Achene jet black, flattened. *Polygonum pennsylvanicum*.
Seeds not jet black. 15.

15. Reddish to yellow, flat, two thirds ovate. *Lepidium virginicum.*
 Brown to black, coarsely granular. *Plantago Rugelii.*
 lemon yellow, slightly double convex. *Solanum carolinense.*
16. Achene having vertical stripes. *Cirsium lanceolatum.*
 Surface having vertical lines. *Digitaria sanguinalis.*
 Achene having vertical spotted ridges. *Lactuca scariola.*
 Achene having warty ribs, obovoid. *Anthemis Cotula.*
 Seed coiled, conical. *Salsoli Kali.*
 Seed with 3 to 6 curved rows of tubercles.
 Seed brownish, flattened. *Stellaria media.*
 Seed lead colored, .5 mm. in diameter. *Silene antirrhina.*
 Seed wrinkled, base white-tubercled. *Lithospermum arvense.*
 Caryopsis inclosed with scales having transverse striations.
 Straw colored, striations branched. *Setaria glauca.*
 Green, striations faint. *Setaria viridis .*
 Seed minutely pitted, ovoid to spherical. *Cuscuta arvensis.*
 Seed with faint radiating striations. *Chenopodium albu m.*
17. Lens shaped. 18.
 Not lens shaped. 19.
18. Seeds circular, .7 to .9 mm. *Amaranthus graecizans.*
 Seeds obovate, 1 to 1.2 mm. long. *Amaranthus retroflexus.*
19. Groove on one side, grain reddish brown. *Bromus secalinus.*
 No groove on one side. 20.
20. Achene seal brown, polished, ovoid. *Ambrosia artemisiifolia.*
 Achene tan, cup shaped at apex. *Cirsium arvense.*

Descriptions.

Gramineae. Grass family.

Setaria glauca. (*Ixophorus glaucus.*) Yellow fox-tail.

Pigeon grass. After rubbing, the spikelet consists of a grain or caryopsis and two firm coverings called respectively lemma and palea. This seed-like structure is straw colored, concave on one side and very convex on the other; prominent transverse striations mark the surface of the lemma and palea; apex slightly three toothed; 2.5 to 3 mm. long and 1.5 mm in diameter. Common impurity in clover, millet, alfalfa and timothy. Plate I.

Setaria viridis. (*Ixophorus viridis.*) Green fox-tail.

This seed-like structure, as in *Setaria glauca*, consists of a grain or caryopsis and two firm coverings. It is green, having the surface marked by faint transverse striations; 1.5 mm. to 2 mm. long and .8 mm. in diameter. Common in clovers, alfalfa, and millet. Plate I.

Digitaria sanguinalis. (*Syntherisma sanguinalis.*) Finger grass. Large crab grass. After severe rubbing, the spikelet consists of a grain or caryopsis and two firm coverings - lemma, which is on the convex side, and palea. It is straw colored to gray, bobbin like, surface marked by vertical lines; 2 to 2.5 mm. long. In grass, red clover and alfalfa seed. Plate VI.

Bromus secalinus. Cheat, Chess. Grain or caryopsis, reddish brown, somewhat spindle shaped, vertical groove on one side to which is often attached a row of bristles; 6 to 7 mm. long. Impurity of wheat and red clover. Plate V.

Polygonaceae. Buck-wheat family.

Rumex crispus. Curled dock. Yellow dock. Narrow-leaved dock. Achene brown, shiny, three sided, apex attenuate; 1.5 to 2 mm. long and 1.3 mm. in diameter half-way between base and apex. Common impurity in red clover, alfalfa and grass seed. Plate II.

Rumex obtusifolius. Broad-leaved dock. Bitter dock. Achene dark brown, three sided, very attenuate at apex; 2 to 2.5 mm. long and 1 to 1.3 mm. in diameter half way between base and apex. In red clover and alfalfa. Plate II.

Rumex Acetosella. Field sorrel. Sheep sorrel. Red-top sorrel. Achene not easily freed from reddish brown calyx. Three sided, angles rounded, abruptly pointed at apex; 1 to 1.5 mm. long. In clover, alfalfa and grass seed. Plate II.

Polygonum Convolvulus. Black bindweed. Wild buck-wheat. Achene black, three sided, angles rounded, concave sides; 3 mm. long and 2 mm. in diameter half way between base and apex. Common in red clover, barley and oats. Plate II.

Polygonum pennsylvanicum. Pennsylvania smart-weed. *Pennsylvania persicaria*. Achene jet black, lenticular, surface finely granular, short abrupt apex; 2.5 mm. short diameter and 3 mm. long diameter. Common impurity of red clover. Plate I.

Chenopodiaceae. Goosefoot family.

Chenopodium album. Smooth pigweed. Lamb's quarters. Pigweed. White goosefoot. The seed when deprived of its cover-

ing, which is the calyx and the wall of the utricle, appears black. If this covering is not removed, it appears gray. Somewhat lens-shaped, a groove extending nearly half way from edge to center; 1.5 to 1.8 mm. in diameter. Often in clover, alfalfa, and grass seed. Plate V.

Salsola Kali. (*Salsola Tragus.*) Russian thistle. Seed conical, embryo coiled, gray; 2 mm. in diameter. In clover and alfalfa. Plate IV.

Amaranthaceae. Amaranth family.

Amaranthus graecizans. Tumbleweed. Seed shiny black, highly polished, circular with notch at one edge; .7 to .9 mm in diameter. In red clover and grass seed. Plate V.

Amaranthus retroflexus. Rough pigweed. Redroot. Seed similar to *Amaranthus graecizans* in color, ovate with notch at edge; 1 to 1.2 mm. long and .8 to .9 mm. in diameter at base end. In red clover and grass seed. Plate V.

Carophyllaceae. Pink family.

Stellaria media. (*Alsine media.*) Common chickweed. Seed brownish, three to six curved rows of tubercles, flattened; a groove extending about $1/3$ distance to the center; 1 mm. in diameter. In red clover, alsine clover and alfalfa. Plate IV.

Silene antirrhina. Sleepy catchfly. Seed lead colored, four to six rows of curved tubercles on each side; .5 mm. in diameter. In grass and red clover seed. Plate IV.

Cruciferae. Mustard family.

Brassica arvensis. Charlock. Wild mustard. Seed black, spherical with surface finely reticulated; 1.2 mm. to 1.5 mm. in diameter. Common impurity of red clover, timothy and alfalfa. Plate VI.

Brassica nigra. Black mustard. Seed brownish, globose, the surface more coarsely reticulated than the surface of *Brassica arvensis*; 1.3 to 1.8 mm. in diameter. In red clover and timothy seed. Plate VI.

Lepidium virginicum. Wild peppergrass. Tongue grass. Common peppergrass. Large peppergrass. Seed reddish to yellow, flat, surface granular, two thirds ovate; 1 to 1.5 mm. in diameter. Common impurity of clover, alfalfa, and grass seed. Plate I.

Convolvulaceae. Convolvulus family.

Cuscuta arvensis. Field dodder. Seed yellowish brown, ovoid to spherical, ridge on one side, the other rounded; surface minutely pitted; .6 to 1 mm. in diameter. Common impurity of alfalfa and red clover seed. Plate V.

Boraginaceae. Borage family.

Lithospermum arvense. Wheat thief. Bastard alkanet. Corn Cromwell. Stoneseed. Redroot. Nutlet dull brown, apex pointed, base truncate having 2 white tubercles, keeled on inner side; 2.5 to 3 mm. long and 1.5 mm. wide half way between base and apex. Common impurity in wheat, rye, clover and alfalfa seed. Plate VI.

Solanaceae. Nightshade family.

Solanum carolinense. Horse nettle. Bull nettle, Sand brier. Seed lemon yellow, slightly double convex, surface granular; 1.5 to 2 mm. in diameter. Impurity of clover and grass seed. Plate I.

Plantaginaceae. Plantain family.

Plantago Rugelii. Red-stem plantain. Rugel's plantain. Seeds brown to black, coarsely granular, angles acute, forms variable--oval, oblong, rhomboidal; 1 mm. in diameter at widest place and 2 to 2.5 mm. long. One of the most common weed seeds in clover, alfalfa and grass seed. Plate I.

Plantago aristata. Large bracted plantain. Western buckhorn. Seed brown, canoe shaped with convex side marked by a transverse groove; a white line bounding base of canoe inside, two pits appearing from concave side; 1.2 to 1.5 mm. in diameter and 2.5 to 3 mm. long. Common impurity of red clover and alsike clover. Plate II.

Plantago lanceolata. Buckhorn. Narrow leaved plantain. Rib grass. English plantain. Seed brown, canoe shaped with thick wall, a scar seen from middle of concave side; 1 mm. in diameter and 2 mm. long. Common impurity of red clover, alfalfa, alsike clover and grass seed. Plate II.

Compositae. Composite family.

Erigeron annuus. Daisy fleabane. Sweet scabious. Whiteweed. White-top. Achene brownish-white, slightly hairy

with whorl of short bristles at apex; .3 mm. in diameter and 1 mm. long. Impurity of grass seed. Plate III.

Ambrosia artemisiifolia. Common ragweed. Small ragweed. Hogweed. Roman wormwood. Wild tansy. Involucre grayish, top-shaped, armed with 6 to 10 short, acute spines; 3.5 to 4 mm. long. If there has been thrashing, the outer covering may have been removed, exposing the achene. It is seal brown, the surface polished, ovoid, a large tubercle at the base; 2.5 mm. long and 1.5 to 1.8 mm. in diameter. Common impurity of red clover, wheat, barley and grass seed. Plate III.

Anthemis Cotula. Dog-fennel. Mayweed. Dillweed. Achene brownish, obovoid, the surface warty ribbed, a tubercle projecting from the apex; 1.3 to 1.5 mm. long. Common impurity of red clover, timothy, blue grass and alfalfa seed. Plate IV.

Cirsium lanceolatum. (*Carduus lanceolatus*.) Common thistle. Bull thistle. Burr or spear thistle. Achene straw colored, slightly flattened, the surface marked by vertical stripes, a large tubercle in the center of a cup-like apex; 4 to 5 mm. long and 1 to 1.5 mm. in diameter. Common impurity in clover, alfalfa and grass seed. Plate IV.

Cirsium arvense. (*Carduus arvensis*.) Canada thistle. Creeping thistle. Achene tan color, obovoid to oblong, cup-shaped at apex with a small tubercle in the center of it; 3 to 3.5 mm. long and .7 to 1 mm. in diameter. Common impurity of clover, alfalfa and grass seed. Plate V.

Lactuca scariola. Prickly lettuce. Compass plant. Achene brownish, obovate with many black-spotted vertical ridges,

widest towards the tapering apex; 3 to 3.5 mm. long. In grass seed. Plate IV.

Cichorium Intybus. Chicory, Blue sailors. Wild succory. Bunk. Achene light brown, often curved, the apex truncate and crowned with two rows of scales; 2.5 to 3 mm. long and .8 to 1 mm. in diameter. Common impurity of red clover and alfalfa seed. Plate III.

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Plate I

- Row 1. *Lepidium virginicum*.
- Row 2. *Plantago Rugelii*.
- Row 3. *Solanum carolinense*.
- Row 4. *Setaria viridis*.
- Row 5. *Setaria glauca*.
- Row 6. *Polygonum pennsylvanicum*.

Plate II

- Row 1. *Polygonum Convolvulus*.
- Row 2. *Plantago aristata*.
- Row 3. *Plantago lanceolata*.
- Row 4. *Rumex crispus*.
- Row 5. *Rumex obtusifolius*.
- Row 6. *Rumex Acetosella*.

Illustrations

Plate I

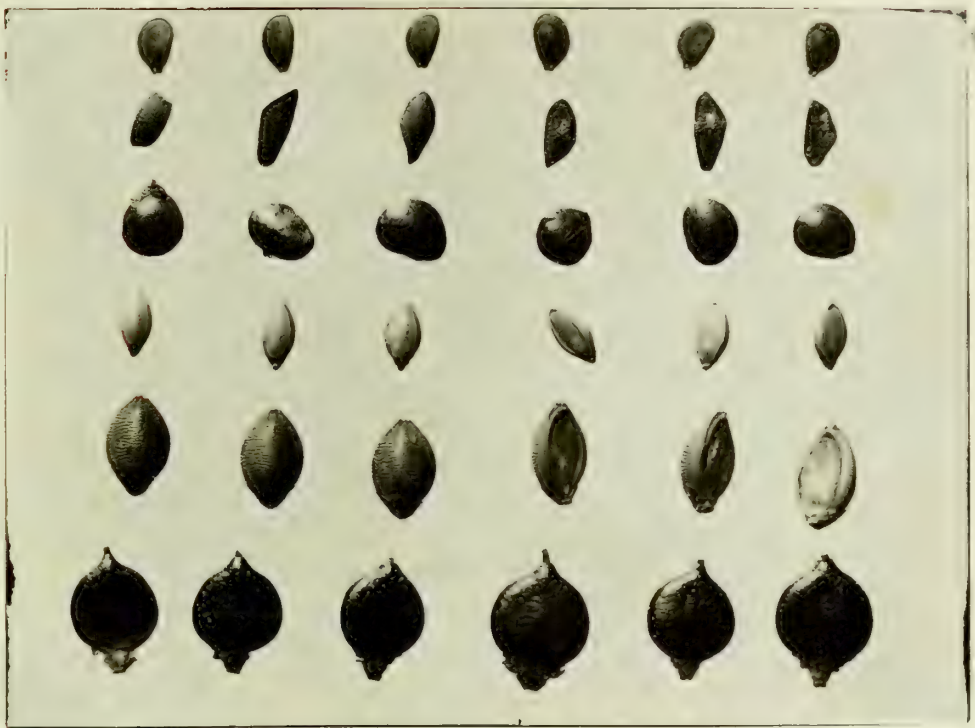


Plate II

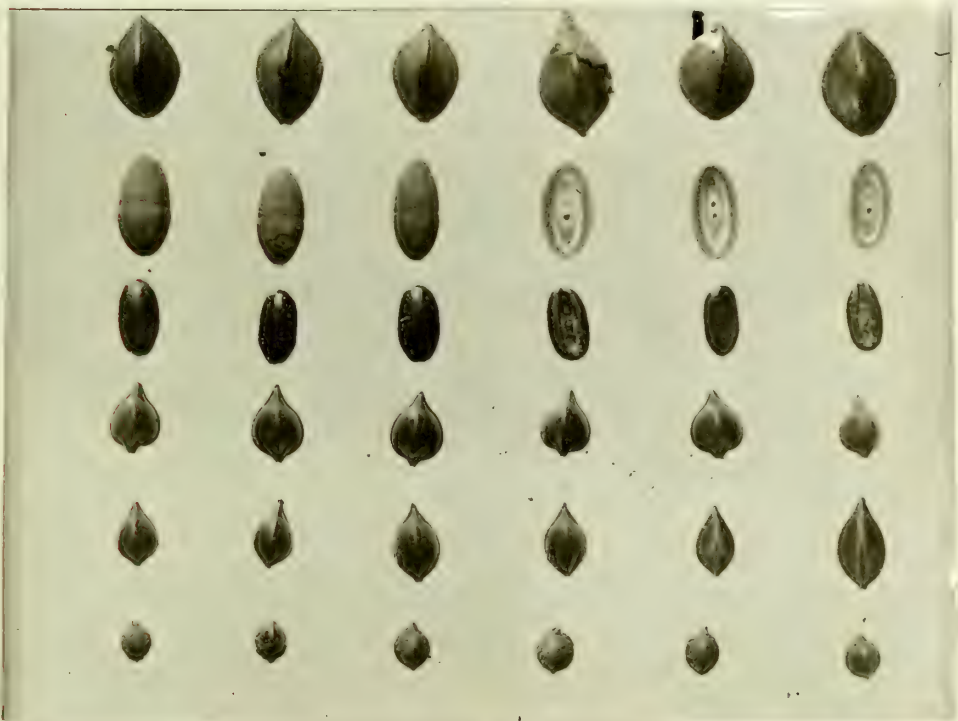


Plate III

- Row 1. *Erigeron annuus*.
Row 2. *Cichorium Intybus*.
Row 3. *Ambrosia artemisiifolia*.

Plate IV

- Row 1. *Silene antirrhina*.
Row 2. *Stellaria media*.
Row 3. *Anthemis Cotula*.
Row 4. *Lactuca scariola*.
Row 5. *Salsoli Kali*.
Row 6. *Cirsium lanceolatum*.

Plate III



Plate IV

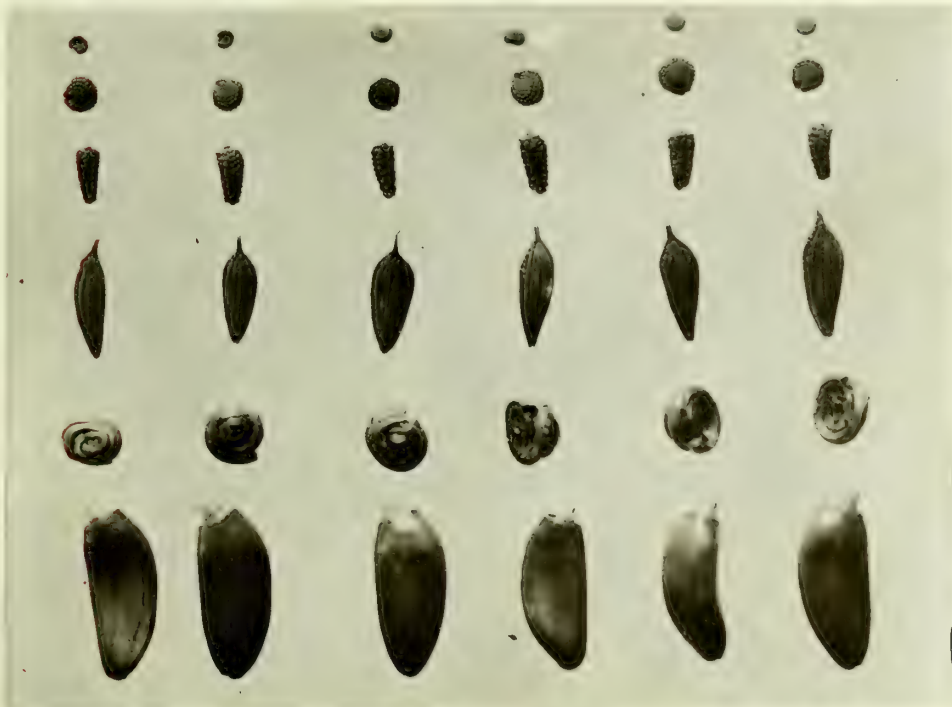


Plate V

- Row 1. *Amaranthus graecizans*.
- Row 2. *Amaranthus retroflexus*.
- Row 3. *Chenopodium album*.
- Row 4. *Cuscuta arvensis*.
- Row 5. *Cirsium arvense*.
- Row 6. *Bromus secalinus*.

Plate VI

- Row 1. *Brassica nigra*.
- Row 2. *Brassica arvensis*.
- Row 3. *Digitaria sanguinalis*.
- Row 4. *Lithospermum arvense*.

Plate V



Plate VI





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